ECE 345/ME 380: Introduction to Control Systems

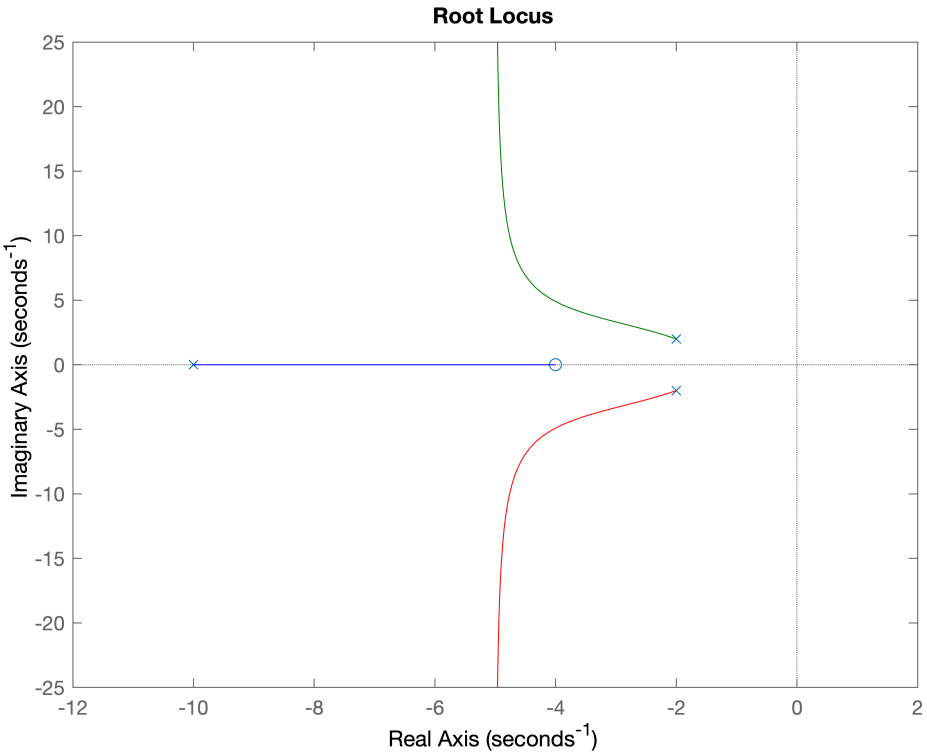
Problem Set #4

1. Consider the lead controller $G(s) = \frac{s+4}{s+10}$.

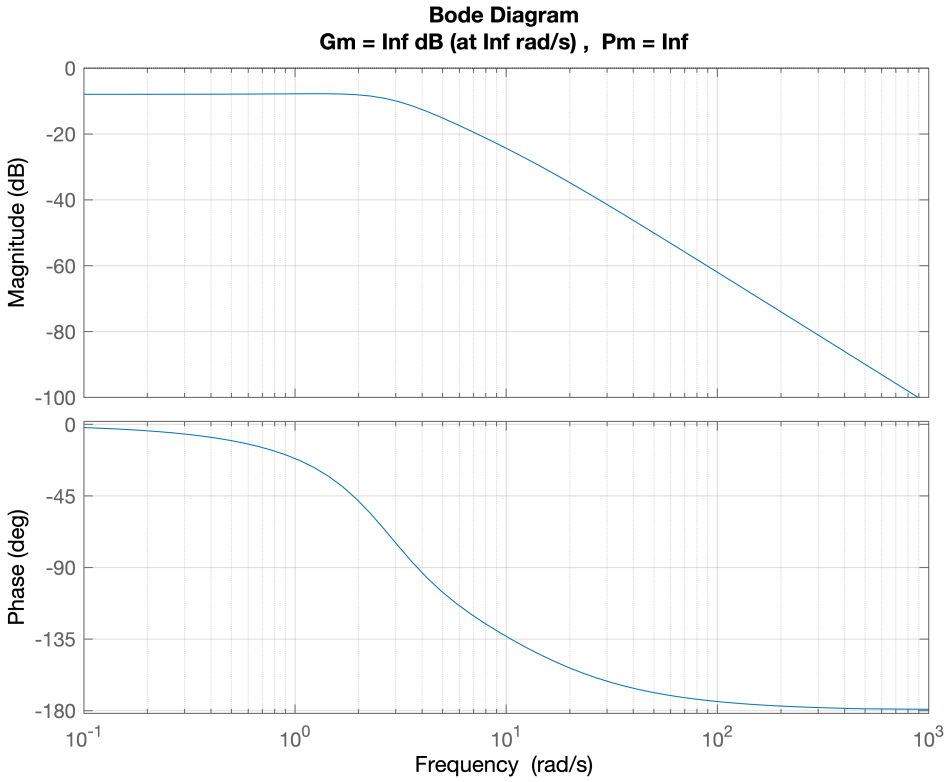
```
GcG1 = tf(8*[1 4],conv([1 10],[1 4 8]))
```

```
GcG1 =

          8 s + 32
  ------------------------
  s^3 + 14 s^2 + 48 s + 80

Continuous-time transfer function.
```

```
rlocus(GcG1)
```




```
margin(GcG1);grid on
```

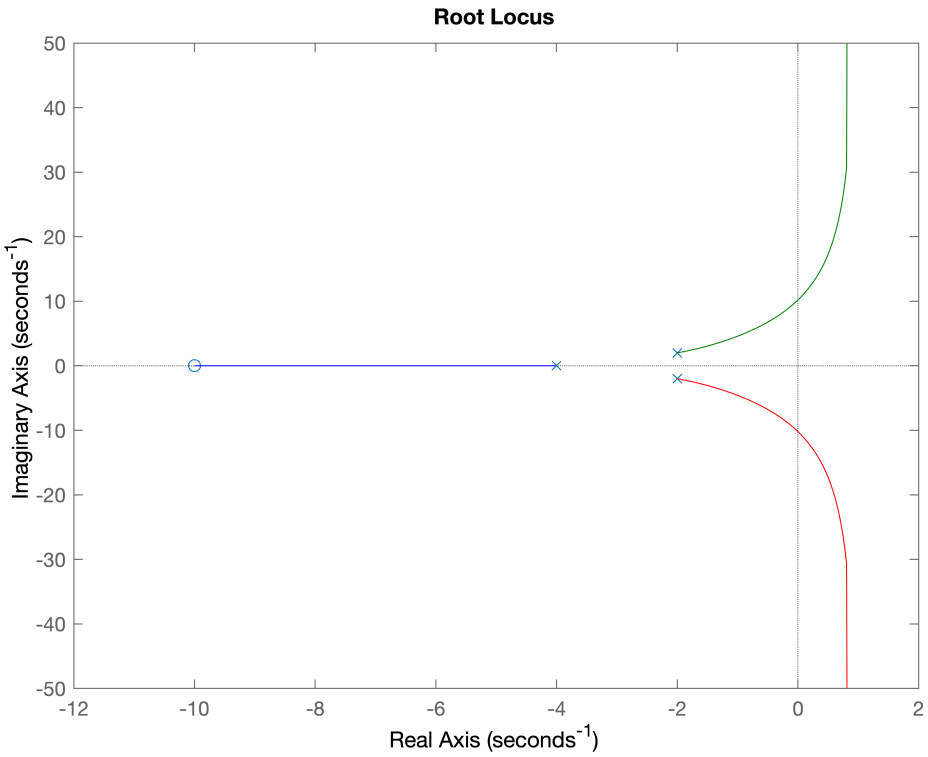


2. Consider the lag controller $G(s) = \frac{s+10}{s+4}$.

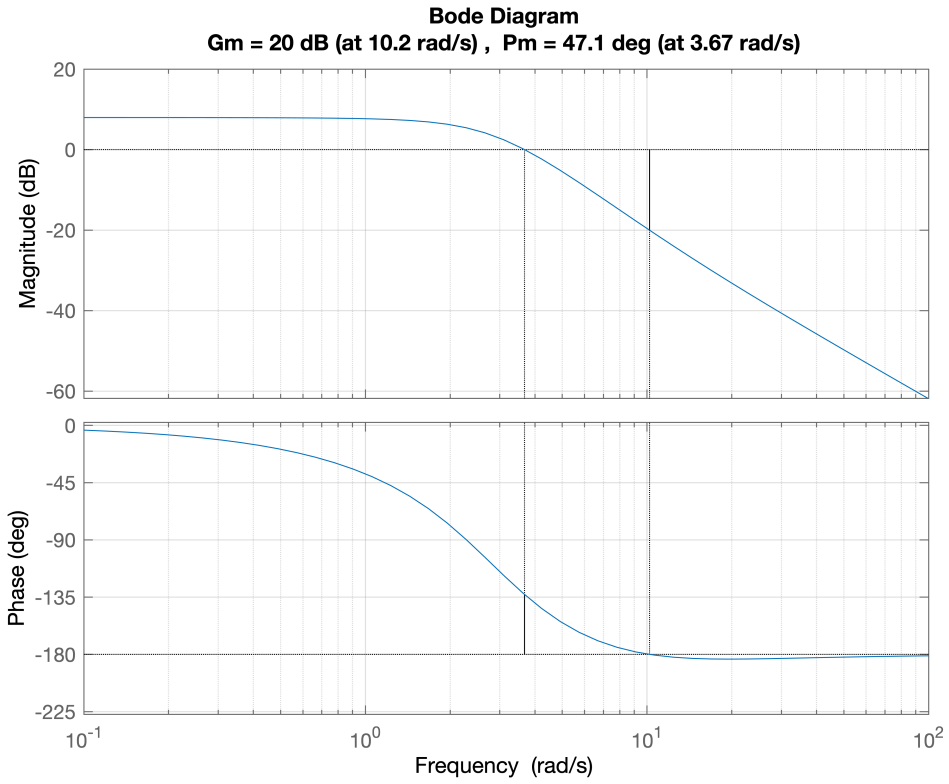
```
GcG2 = tf(8*[1 10],conv([1 4],[1 4 8]))
```

```
GcG2 =

         8 s + 80
  ----------------------
  s^3 + 8 s^2 + 24 s + 32

Continuous-time transfer function.
```

```
rlocus(GcG2)
```




```
margin(GcG2);grid on
```



4. Consider the effect of a Proportional-Integral-Derivative (PID) controller

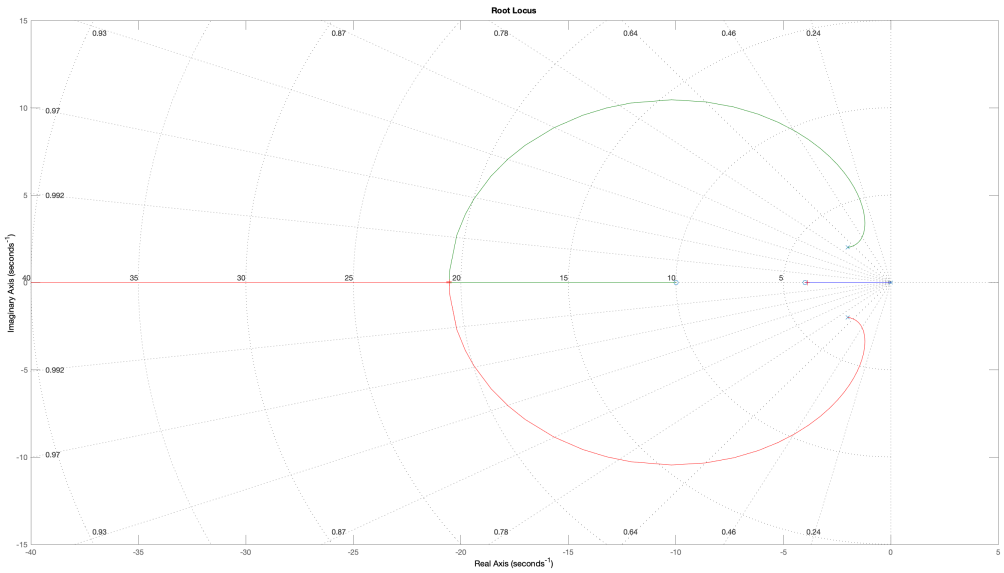
$$Gc(s) = K\frac{(s+4)(s+10)}{s} = 14K + \frac{40K}{s} + Ks.$$

```
GcG3 = tf(8*[conv([1 10],[1 4])],conv([1 0],[1 4 8]))
```

```
GcG3 =

  8 s^2 + 112 s + 320
  -------------------
   s^3 + 4 s^2 + 8 s

Continuous-time transfer function.
```

```
rlocus(GcG3);grid on
rlocfind(GcG3)
```

```
Select a point in the graphics window
```




```
selected_point = -20.5262 + 0.0322i
ans = 5.1213
```